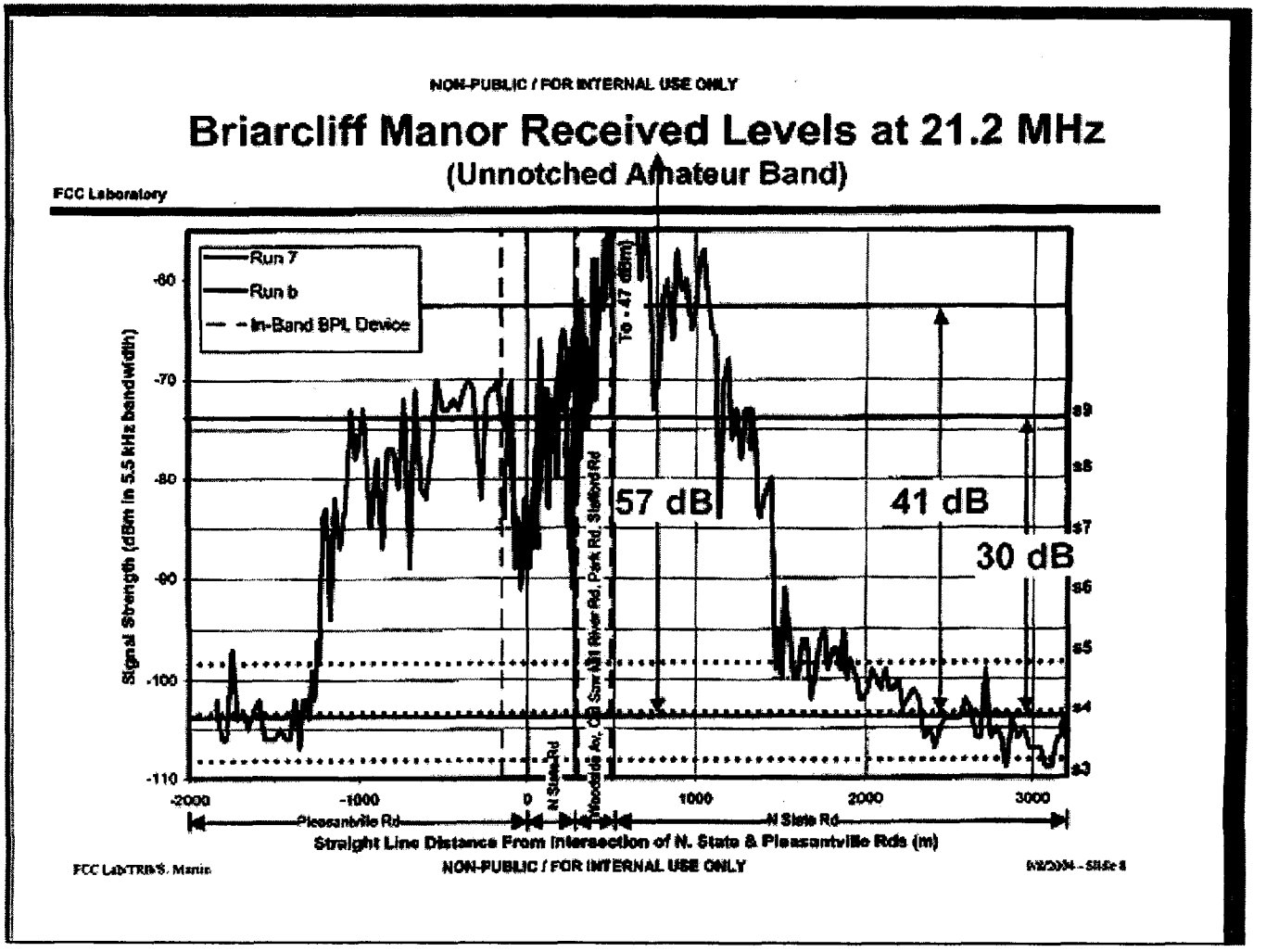

Figure 13 -- These data are from testing performed in Briarcliff Manor, NY. The emissions were not strongest at the devices marked with vertical dashed lines on this graph, but peaked approximately 150 meters away.

Test results like those shown above demonstrate that the original NTIA recommendation to search 1200 meters of power line for the point of maximum emissions has considerable merit. Finding the point of maximum emissions is done easily with a receiver and antenna installed on a motor vehicle. The point of maximum RSL can be noted, and more detailed calibrated field-strength measurements can be performed at that location. The Commission used a similar method to generate some of these graphs and ARRL assembled a mobile test fixture that can make such RSL measurements at normal driving speeds. This is not an expensive technique, and based on the experience of the ARRL staff, finding these peak signal-strength areas would not be a burden on companies making field-strength measurements for compliance purposes.

The emissions from *un-notched* BPL were much stronger than ambient signal levels often used by operators in the Amateur Radio Service for communications. The Commission data show that BPL operating at the maximum Part 15 limits results in

emissions levels that are tens of dB above the ambient noise levels often used for routine HF or VHF communications. When the Commission announced the BPL Notice of Proposed Rulemaking, they made the following observation about signals in the Amateur Radio Service. This observation also applies generally to operation in other Services, such as the Aeronautical Mobile services:

"We recognize that Amateur operations are likely to present a difficult challenge in the deployment of access BPL in cases where amateurs use high gain outdoor antennas that are located near power lines." – FCC Office of Engineering and Technology, Notice of Proposed Rulemaking, February 12, 2004 [3].

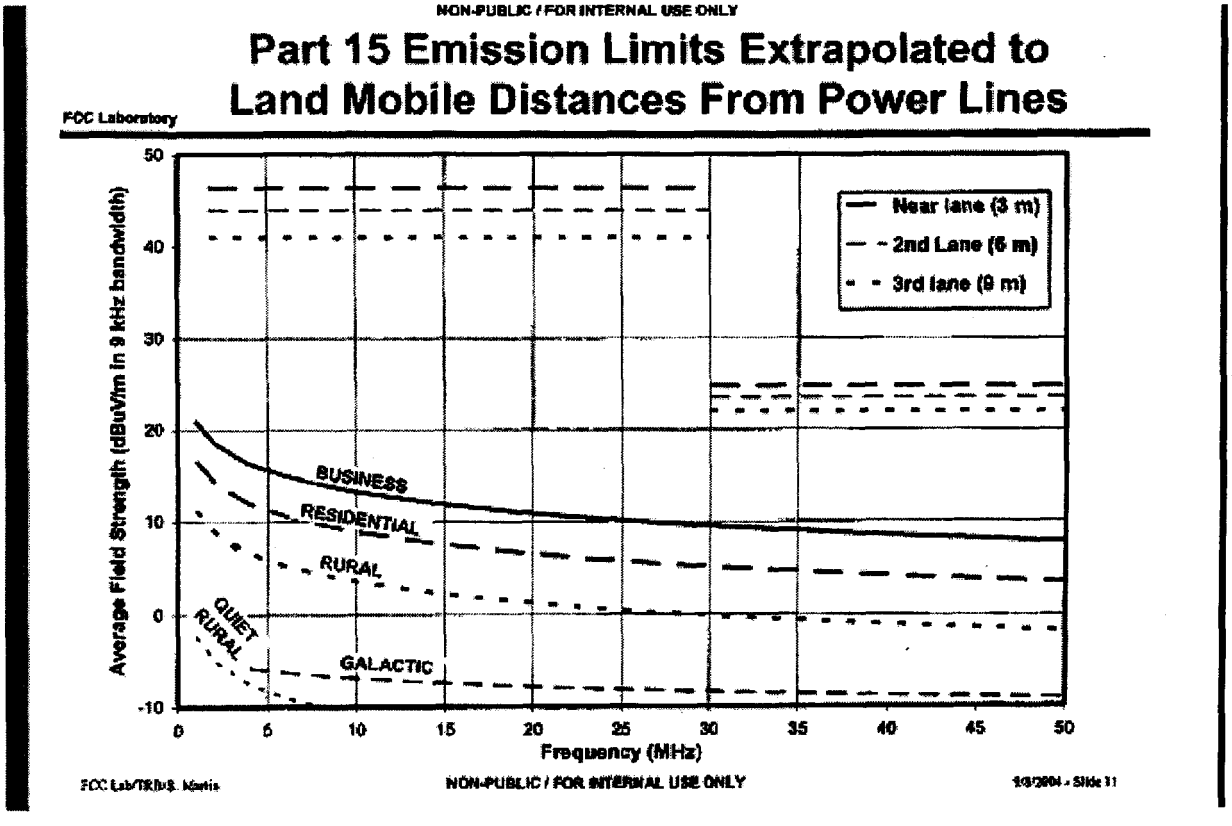

Figure 14 -- In the R&O, the Commission had concluded that the levels ARRL had requested – notching of 40 dB to protect Amateur mobile operation -- had not been justified by the record. The FCC's own test data contradicts this, as the levels shown in this graph support ARRL's position. In fact, based on this graph, ARRL's position was conservative. This graph

[3] To assess this, one has to look at other portions of the FCC presentations to determine what it means by the term "near." On slide 17 of the Raleigh presentation, for example, the Commission indicated that 320 meters is "a short distance" along a power line. Virtually all stations operating in the Amateur Radio Service will have their antenna systems located closer than 320 meters to a power line.

shows as much as 46 dB of degradation from the median values of man-made noise [4].

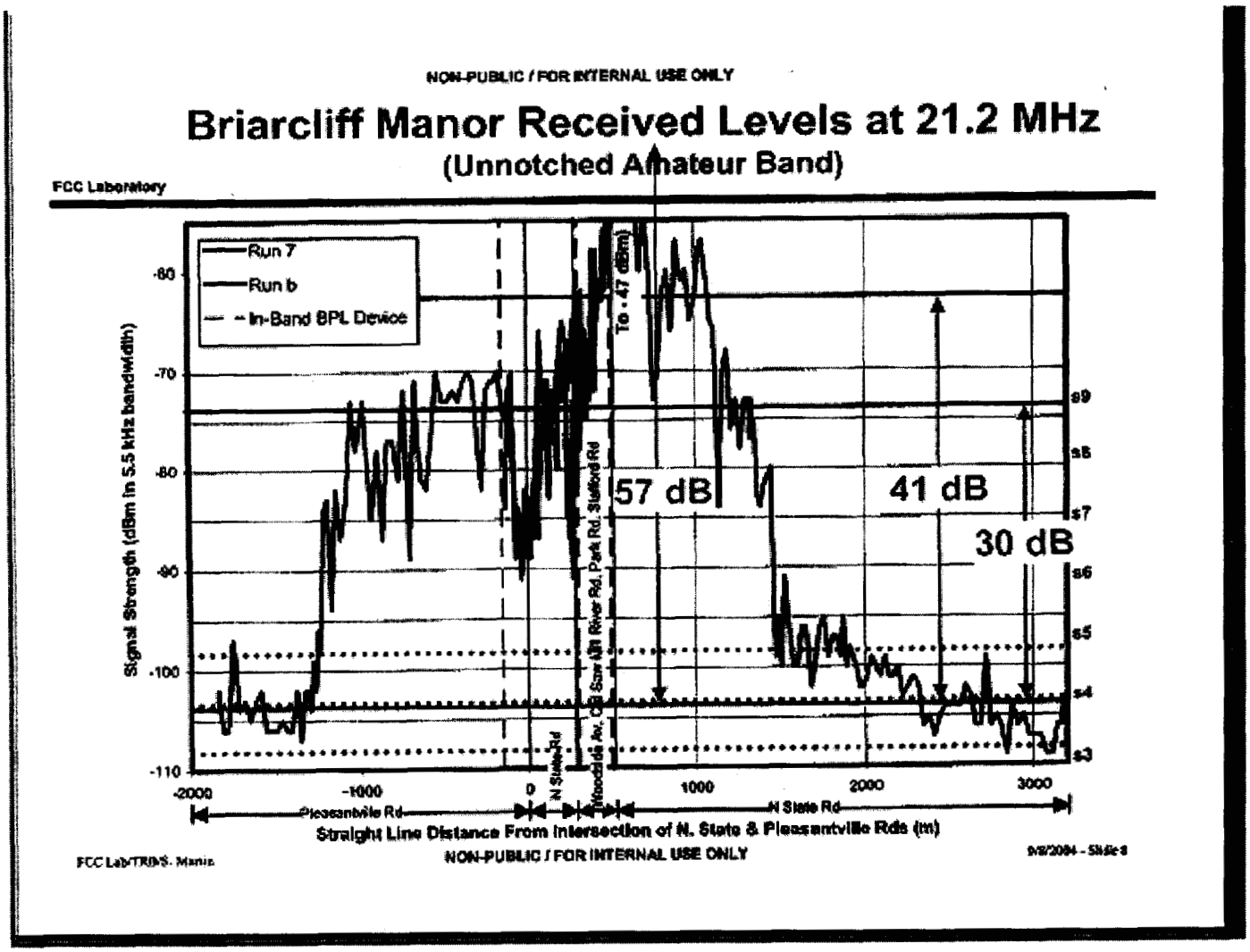

Figure 15 -- This graph shows an extremely strong BPL system causing a minimum of 57 dB of degradation to the communications capability of the Amateur Radio Service. The degradation is still at least 30 dB 1000 meters from the BPL device. These data were taken along Pleasantville and North State Road in Briarcliff Manor, NY. The maximum signal level of –47 dBm is a receiver signal-strength level of approximately S9+26 dB. These data were collected in Briarcliff Manor, NY in un-notched spectrum on 21.2 MHz. The minimum ambient levels recorded were approximately –108 dBm. The average of the ambient levels recorded was –104 dBm.

These data show that the BPL signal was at least 57 dB above the average value of the ambient noise present in the area and approximately 62 dB higher than the

[4] 50% of the values of man-made noise will be below the values shown.

minimum value of ambient levels. BPL equipment operating at this level would require 60 or more dB of notching to avoid causing harmful interference to weaker signals received by a mobile amateur station configured in a similar manner to the FCC mobile receiver.

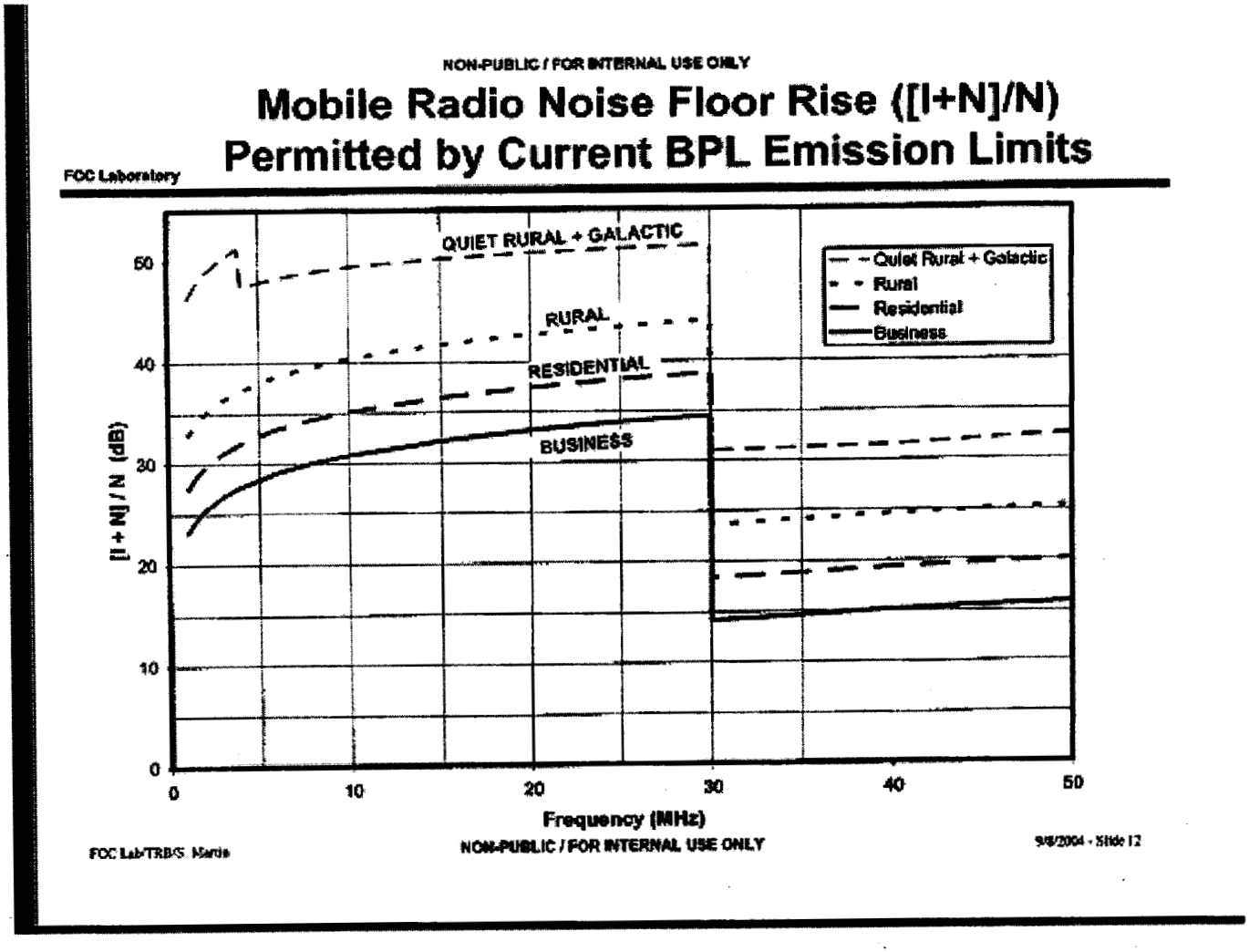

Figure 16 -- This graph shows the probable amount of degradation that is predicted to occur locally from BPL systems operating at the present FCC limits. These calculations are based on the median values of man-made noise and the field strength at a distance of 30 meters. Most antennas that will be affected by BPL will be located at or less than 30 meters distance from the source. Antennas located closer, such as mobile antennas located approximately 10 meters from the radiating power lines, will be degraded by an additional amount based on the specific distance extrapolation factors are used to make compliance measurements at that location[5].

[5] For example, if a 40-dB/distance decade factor is used as described in the present FCC Part-15 rules, approximately 20 dB more degradation than this will occur to mobile stations operating near BPL

There are numerous other examples in the FCC test results that show a similar degradation of spectrum at the points measured. The emissions from *notched* BPL were typically 10 to 20 dB higher than the ambient signal levels often used by operators in the Amateur Radio service for communications.

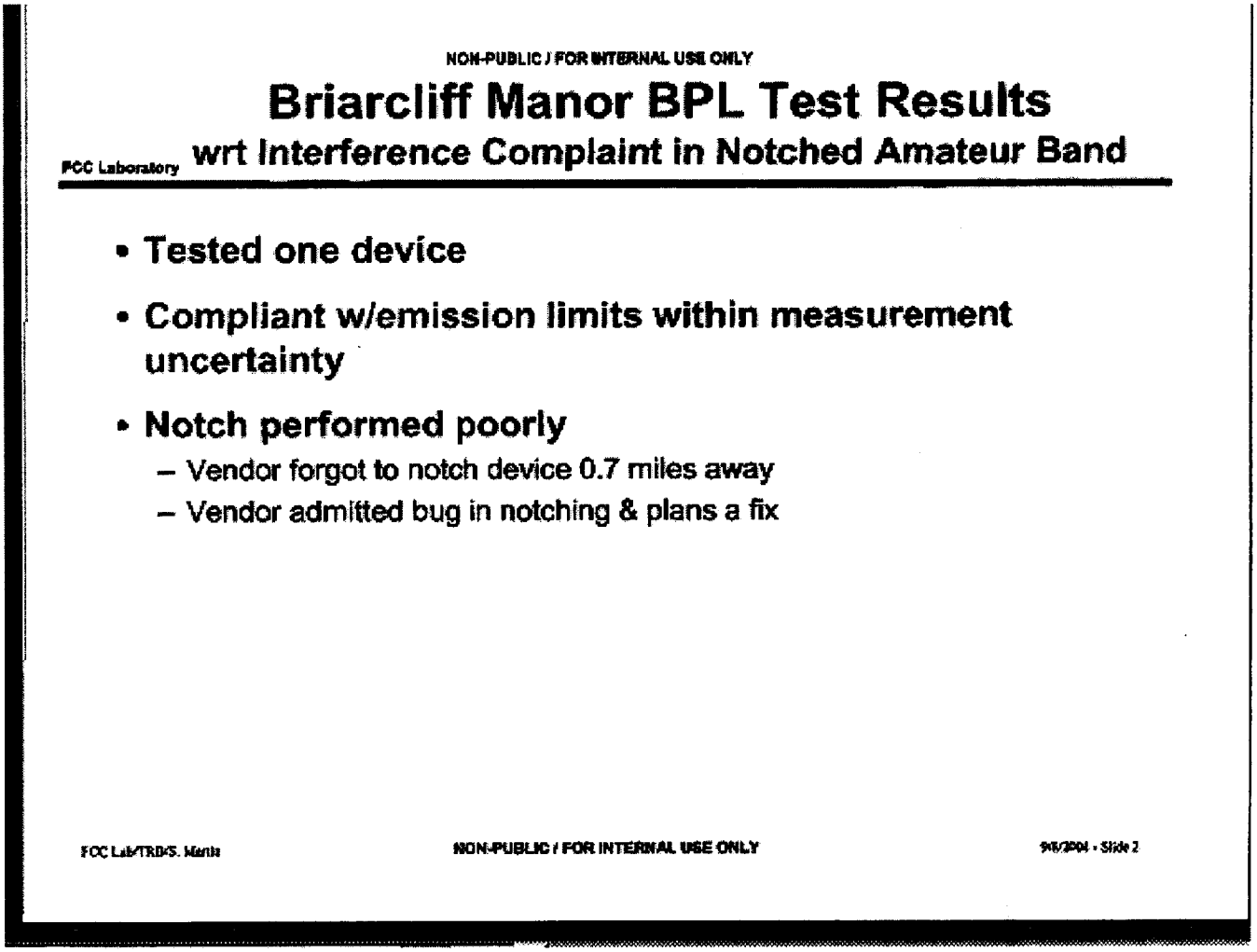

Figure 17 -- The general conclusion on this slide shows that the Commission did *not* find that notching protected radio services from harmful interference in this system.

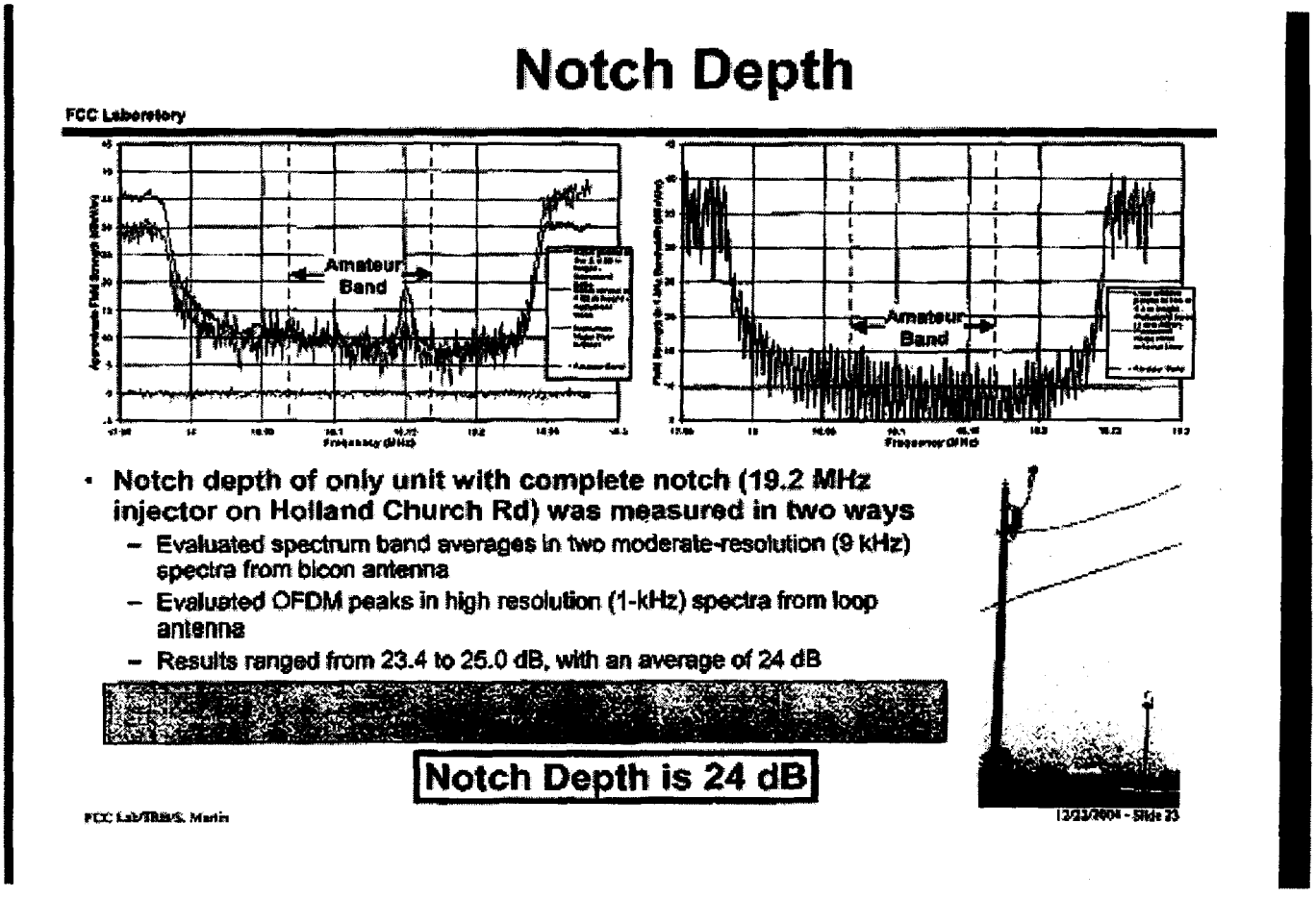

Figure 18 -- This graph shows that the FCC typically measured notch depth of only 24 dB. Note that the notches are not deep and their skirts are not sharp.

The Commission found that the notch depth that was achieved in practice was about 24 dB. In graphs shown earlier in this analysis, Commission staff had calculated that BPL operating at the present limits would degrade spectrum by 40 dB or more. In measurements made by operators in the Amateur Radio Service, degradation of approximately 15 dB was seen in "notched" spectrum. The Commission data is in excellent agreement with those measurements. Signals in the Amateur Radio Service are often weak, operating at or just a few dB above the ambient noise level. Degradation of 15 dB will obstruct many of the signals routinely used by operators in the Amateur Radio Service.

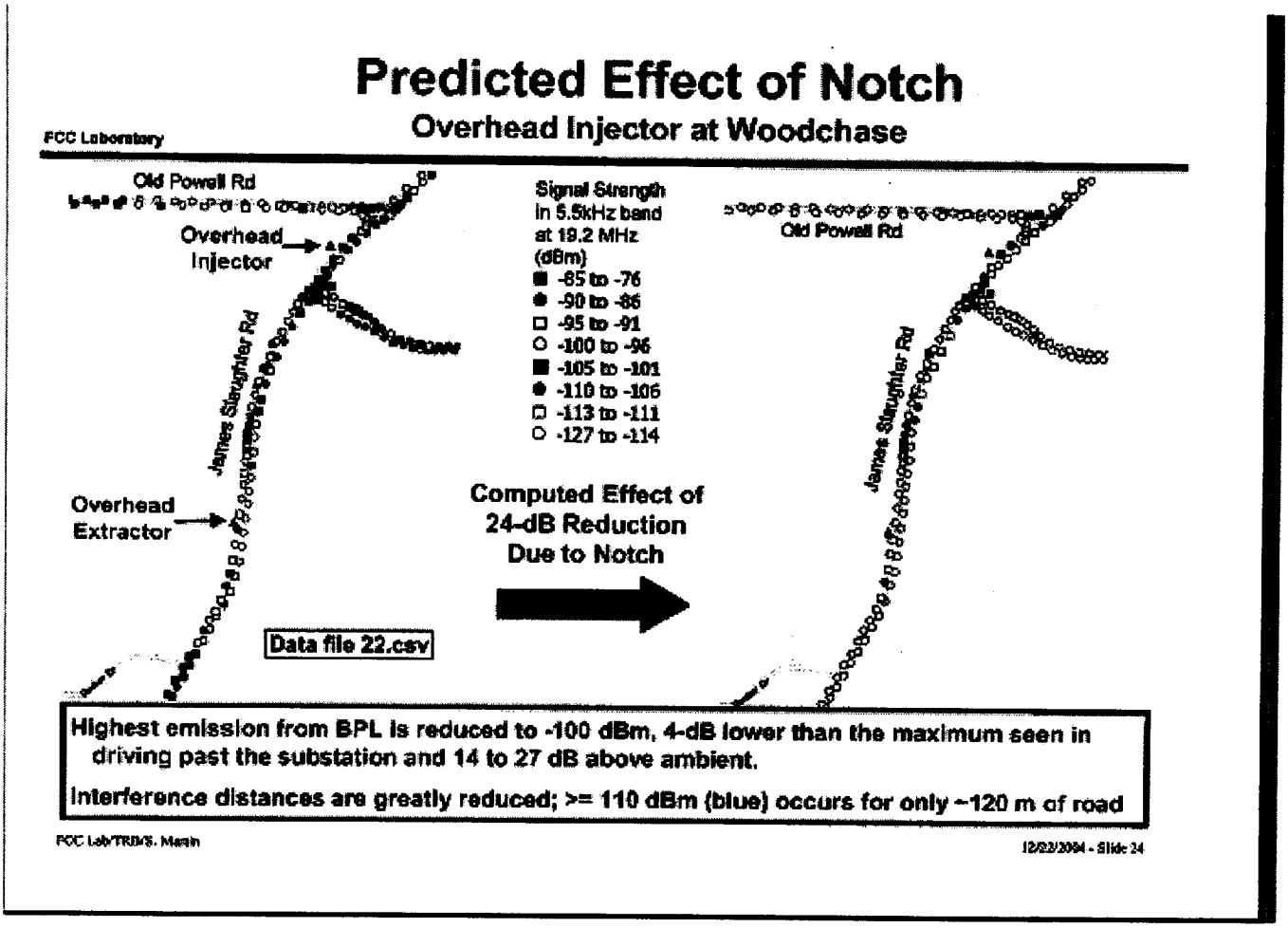

Figure 19 -- It is not possible to tell from the black and white rendition of this slide just what RSLs were present at each location show. It is apparent, however, that the FCC testing shows that the notching allegedly used to mitigate BPL interference leaves BPL signals from 14 to 27 dB above ambient noise levels, again in good agreement with ARRL measurements. Even a few dB of degradation will obstruct some signals that could otherwise be used for communications. This graph shows that although the interference potential is reduced by notching, inadequate notching will significantly reduce the geographical area in which interference-free reception can be expected to occur.

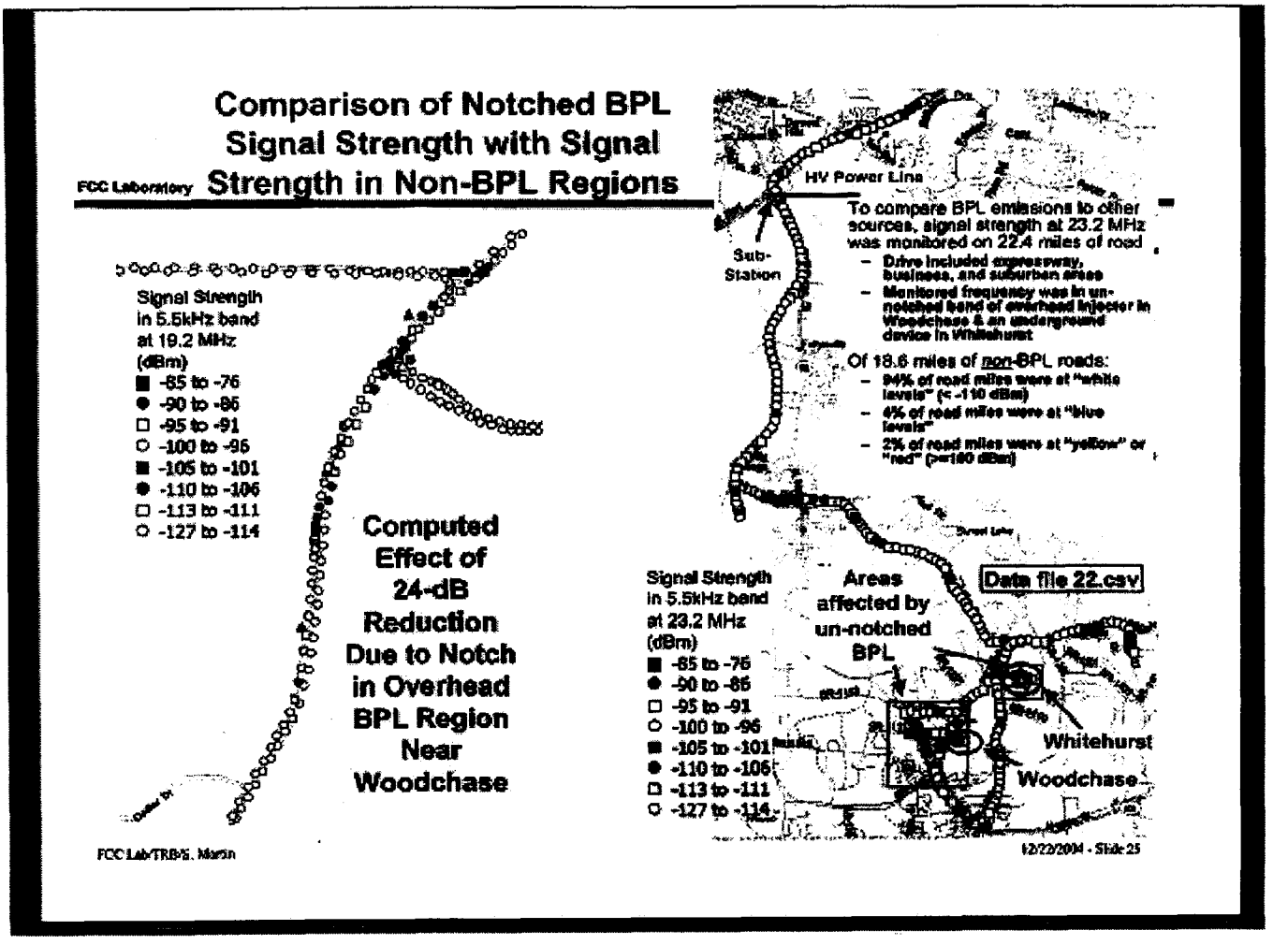

Figure 20 -- this slide shows that, according to FCC measurements, 94% of the geographical area in the vicinity of the BPL system had a relatively low noise level. This was substantially lower near any part of the system carrying BPL.

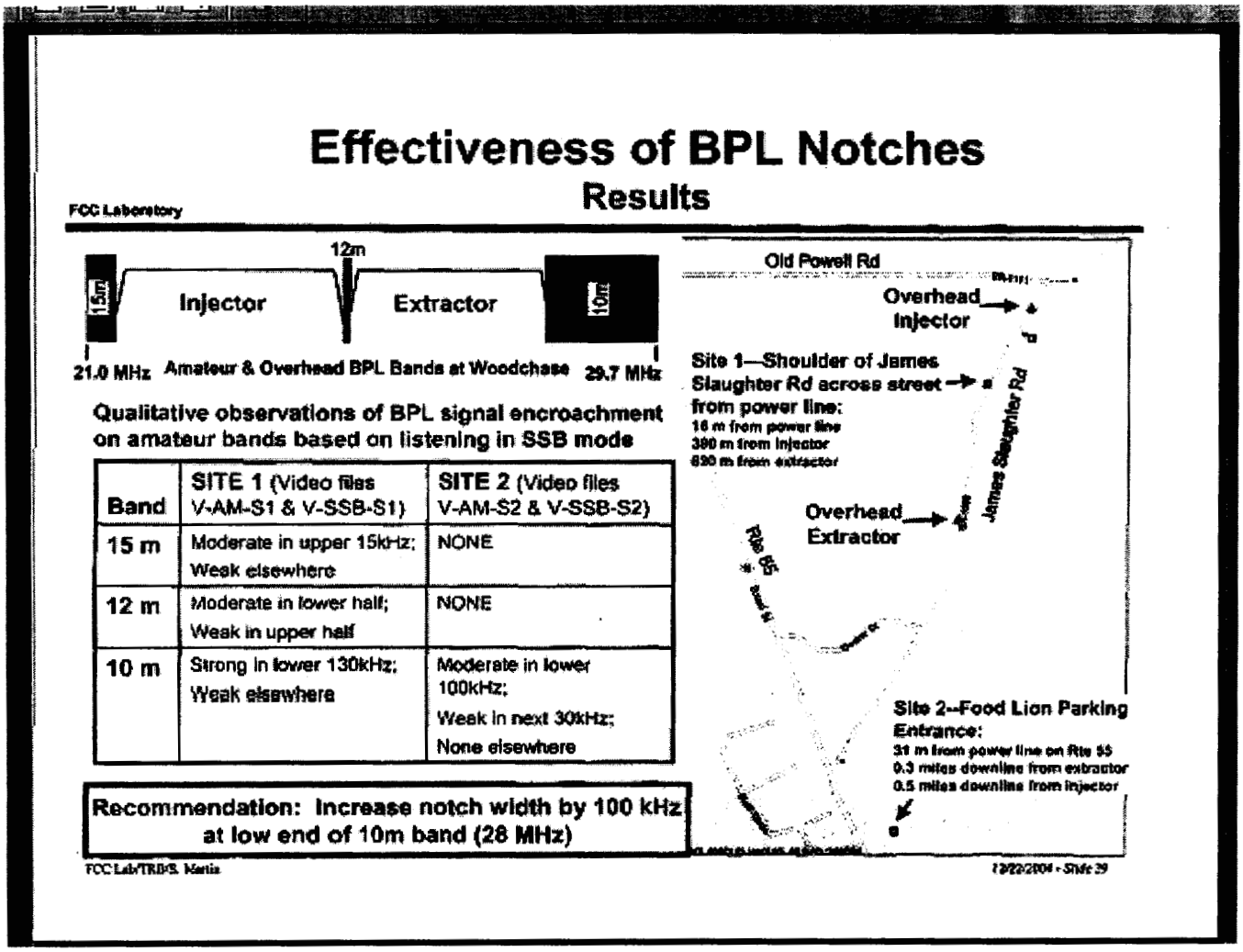

Figure 21 -- This slide characterizes BPL signal encroachment on amateur bands as "weak, moderate or strong," depending on frequency and location. ARRL presumes that the "moderate" levels are representative of the 14 to 27 dB described in other sides. Site 1 is 16 meters from the power line, 390 meters from the BPL injector. At site 2, located 31 meters from the power line, 0.5 miles from the injector, interference was still characterized as "moderate." In this case, the mitigation techniques used were insufficient to protect an amateur station that would be located 0.5 miles away from the BPL source.

The ambient noise levels *without BPL* were found to be in the same approximate range as those found by ARRL, although differences in test equipment and methods used by the Commission and ARRL were evident.

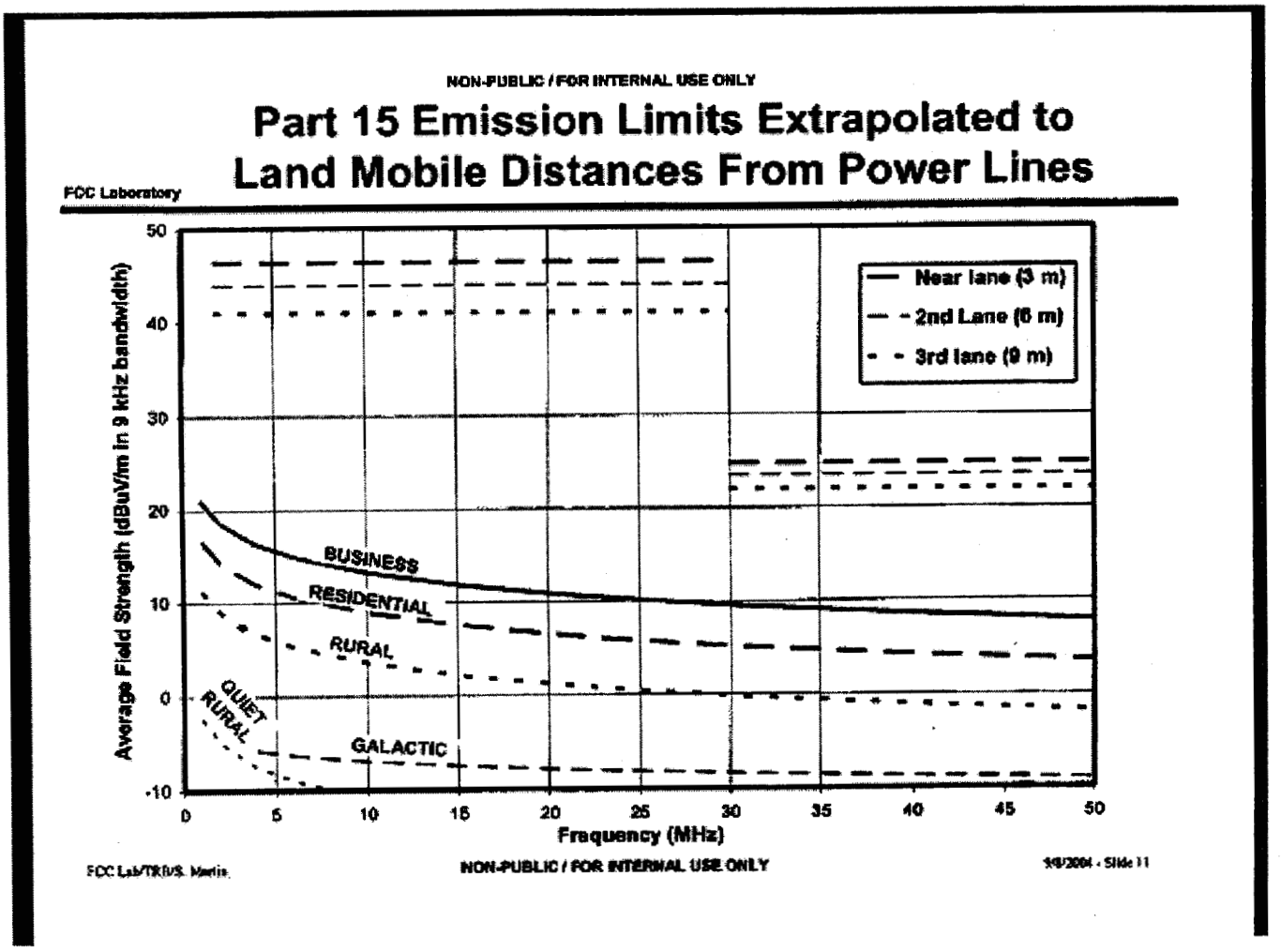

Figure 22 -- Among other things, this slide shows the typically referenced levels of man-made noise outlined in Recommendation ITU-R P.372-8, adjusted to show the levels expected in a 9 kHz bandwidth. For a number of reasons explained herein, these levels are reasonably consistent with the level of 0 dBuV/m that ARRL had recommended as a minimum protection for mobile Amateur Radio operation.

The noise levels shown in Figure 22 above are derived from Recommendation ITU-R P.372-8. These levels were determined in the 1970s to provide information about man-made noise levels in various environments. The term "residential" would include a wide range of human habitats, from apartment buildings in close proximity to electrical wiring to single-family homes located in suburban neighborhoods. The values

shown are the median levels measured. Half of the values measured were below the levels shown. Man-made noise can range from broadband noise that is present in some areas but not in others to discrete signal sources from computers and switch-mode power supplies that are present on some frequencies but not on others. Most man-made noise is also sporadic in time duration, so most of the time, in most locations a communications channel could be found that is at a much lower level than the median values shown above.

In its submissions in response to the NPRM and the NOI, ARRL described measured levels along the street in residential environments with single-family homes ranging from –10 dBuV/m to 0 dBuV/m. It had recommended that a minimum protection level of 0 dBuV/m at a mobile antenna should be required to prevent most mobile stations from experiencing harmful interference. The R&O claimed that the Commission did not find 0 dBuV/m to be a credible representation of the man-made noise that would be typically found in the quiet portions of the 28 MHz Amateur allocation, even though that number is consistent with the noise levels found in the ITU-R Recommendation and the FCC report, as shown above.

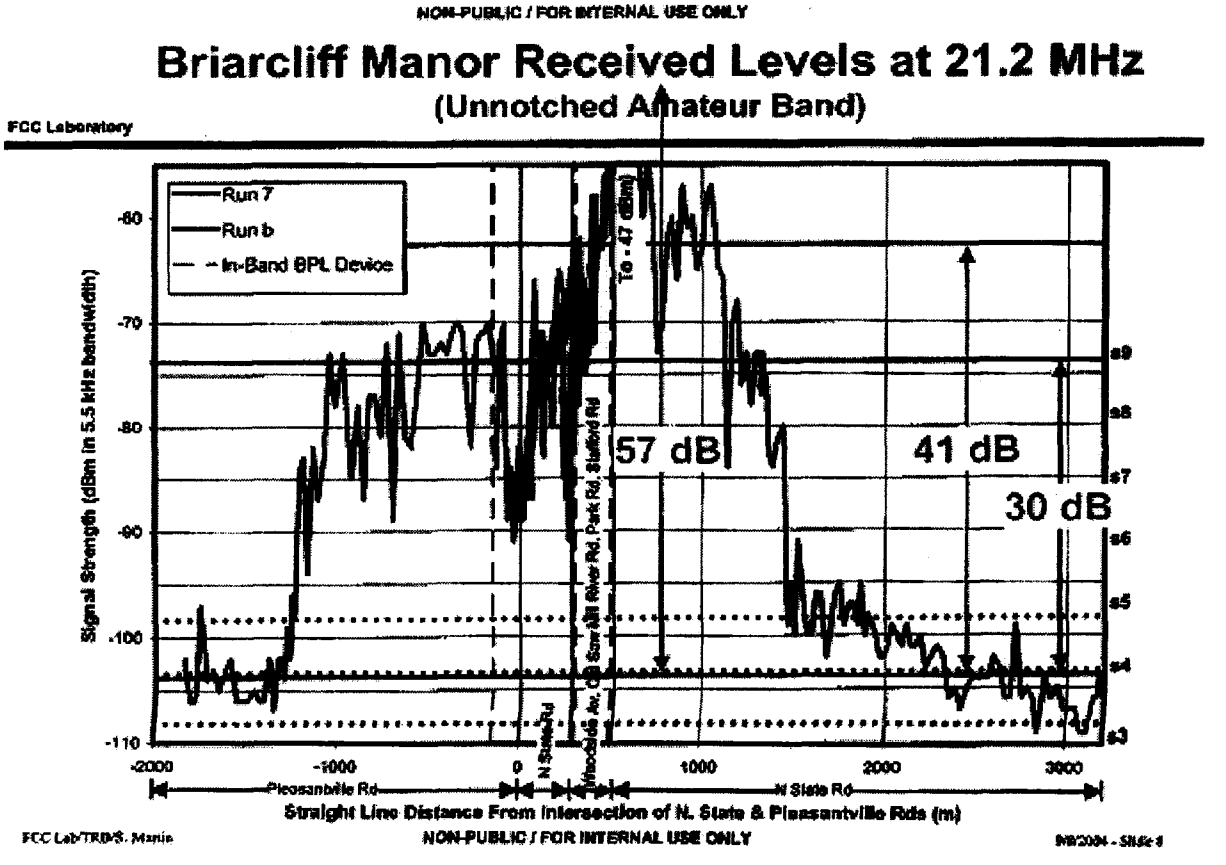

Figure 23 -- This graph shows data from the BPL system at Briarcliff Manor, NY. It was taken using a receiver and a mobile whip antenna along 5000

meters of overhead power line on 21 MHz. The ambient noise level is expressed as a received signal level (RSL) at the receiver, but with the antenna factor of a typical mobile whip on 21 MHz (-0.8 dB/m), the level of ambient noise indicated on this graph of -105 dBm represents a field strength of 3.3 dBuV/m. A receiver's signal strength meter typically responds to peak signals, so this ambient noise level correlates well with the level of 0 dBuV/m that ARRL told the FCC was necessary to protect mobile stations from harmful interference from BPL systems. The minimum RSL shown on this graph is below –110 dBm, representing field strength less than 0 dBuV/m. This, too, is consistent with ARRL's measurements.

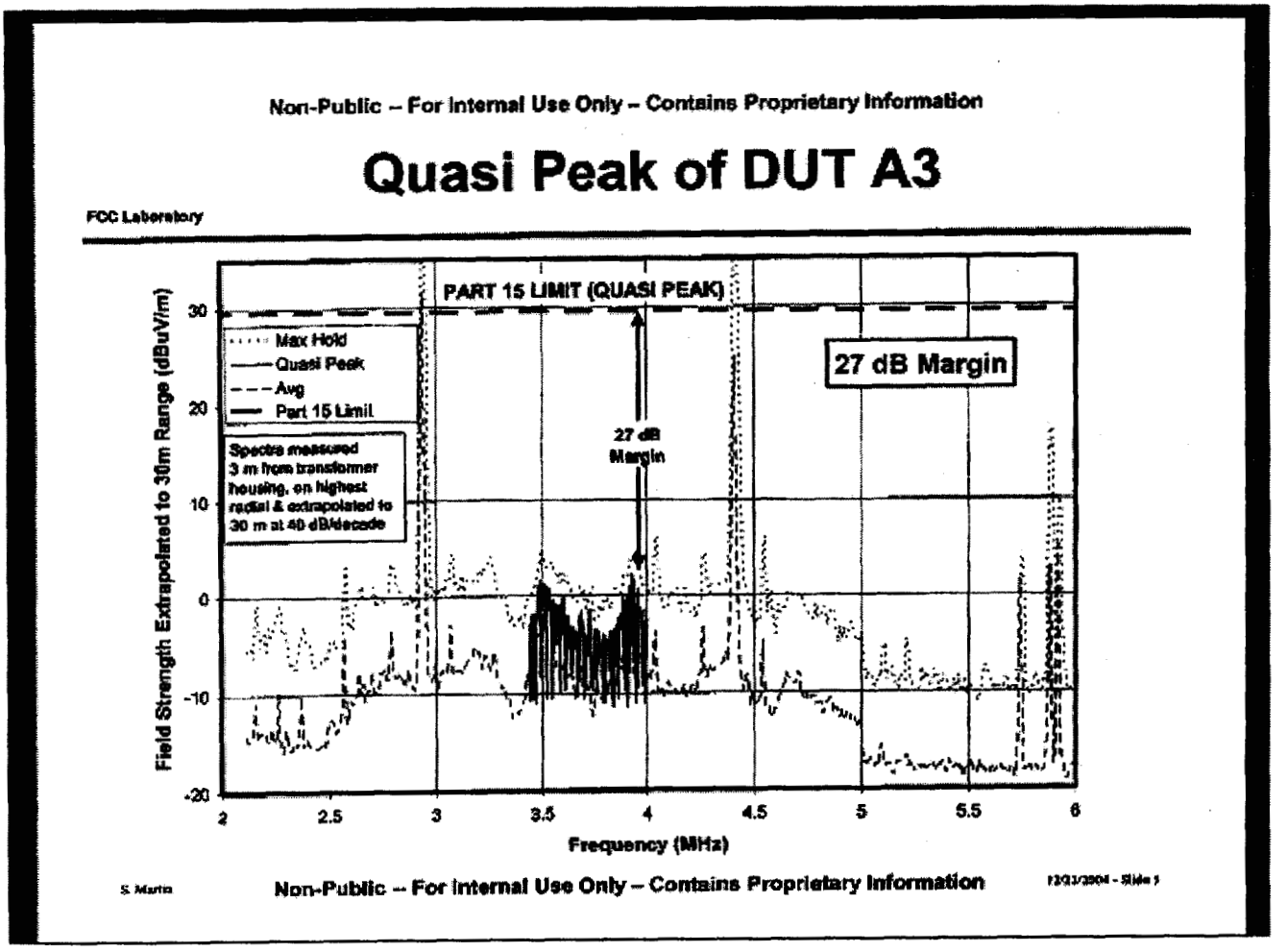

Figure 24 -- This measurement was taken 3 meters from ground-mounted BPL equipment in Allentown, PA. It shows an extrapolated noise level as low as –18 dBuVm/. If this were extrapolated to 10 meters distance – the approximate distance of ARRL ambient-noise level measurements from power lines – the minimum noise level shown on this graph would be at a level of +2.9 dBuV/m. If this level was observed by the Commission immediately adjacent to a BPL device, it was not reasonable for the

Commission to reject ARRL's measurements of 0 dBuV/m to –10 dBuV/m in areas where no BPL is present.

EXHIBIT C

EXHIBIT C
ARRL PETITION FOR RECONSIDERATION

NTIA EVIDENCE THAT INTERFERENCE FROM BPL IS NOT LOCALIZED

NTIA's letter of September 13, 2004, cited in the R&O, includes charts at pages 9 through 11, some of which are reproduced below. The charts, which ARRL did not have the opportunity to address in this proceeding because they were filed considerably after the comment and reply comment dates in the proceeding, demonstrate that the probability of harmful interference at 4 MHz from BPL operation is essentially 100 percent at distances up to 200 meters from a BPL-carrying power line, increasing to 200 meters at 20 MHz. The definition of harmful interference utilized in this NTIA analysis is premised on a 1 dB increase in noise. There are Amateur HF allocations at 3.5, 5, 7, 10 and 14 MHz, which are extremely heavily used, day and night, 24 hours per day, 7 days per week, 52 weeks per year. These interference contours are devastating to Amateur Radio communications.

NTIA, at Section 6 (pages 6-1 through 6-4 of the NTIA Phase 1 Report) provides an explanation of (I+N)/N. On page 6-3, NTIA states: "For most frequency sharing situations, it is well-established in international and domestic spectrum management practices to generally limit interfering signal levels in a manner that preserves good control over radio system performance by designers and operators (*e.g.* (I+N)/N=0.5 or 1 dB)."

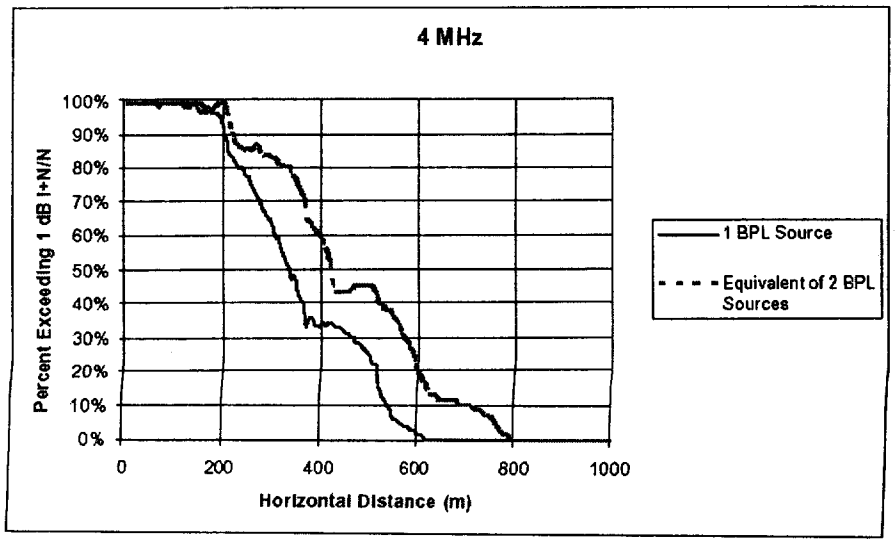

Figure 1 – Exclusion zone / coordination area radii for 4 MHz and 0 dBi receiver antenna gain toward the power line

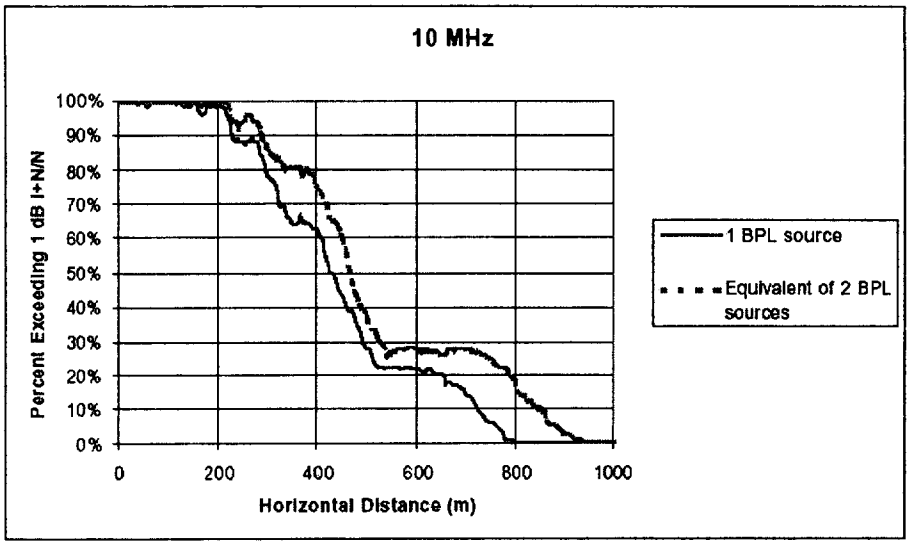

Figure 2 – Exclusion zone / coordination area radii for 10 MHz and 0 dBi receiver antenna gain toward the power line

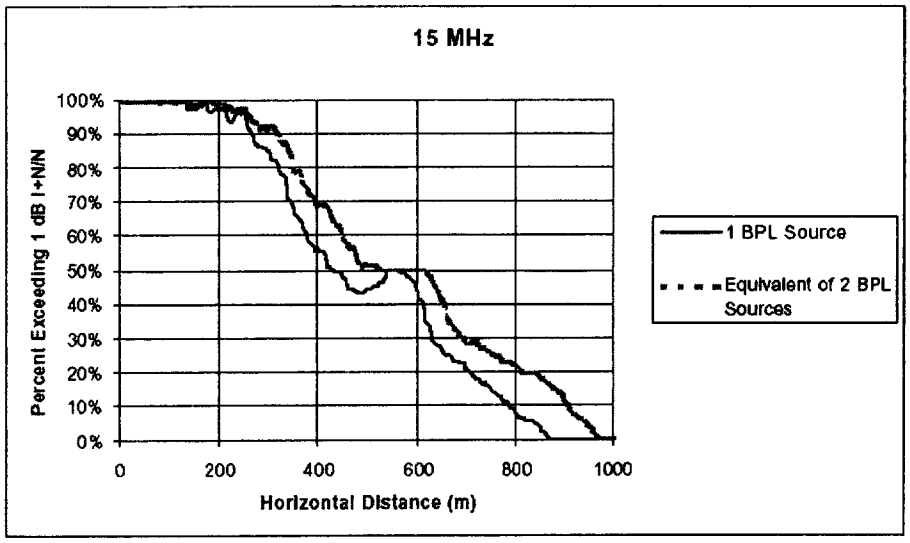

Figure 3 – Exclusion zone / coordination area radii for 15 MHz and 0 dBi receiver antenna gain toward the power line

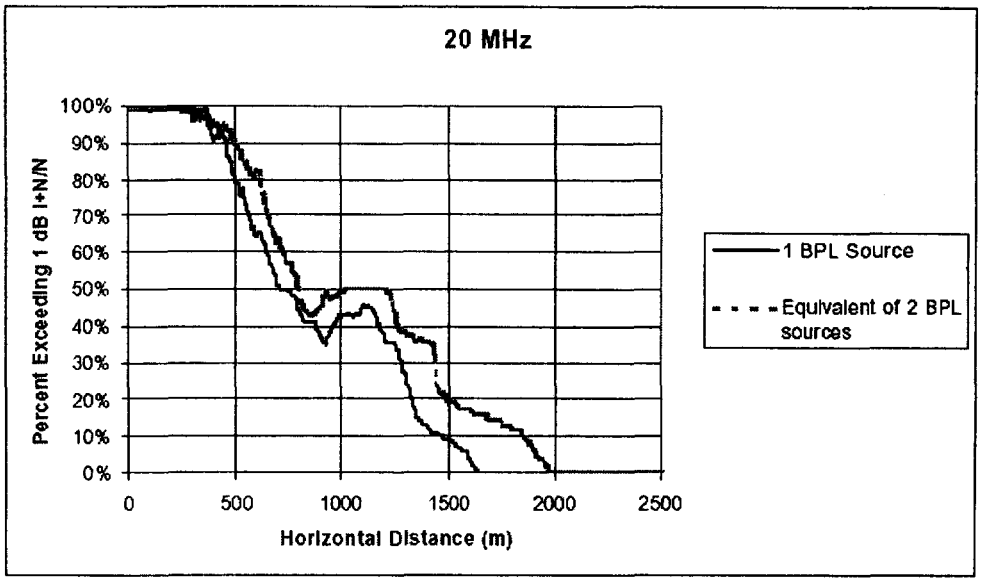

Figure 4 – Exclusion zone / coordination area radii for 20 MHz and 0 dBi receiver antenna gain toward the power line

EXHIBIT D

EXHIBIT D
ARRL PETITION FOR RECONSIDERATION

FCC INACTION ON FILED HARMFUL INTERFERENCE COMPLAINTS FROM BPL TEST SITES

In Raleigh, North Carolina, complaints from radio amateurs were filed with the Commission as early as March of 2004. It was not until June of 2004 that an acknowledgement of the receipt of the complaints was given by OET staff. ARRL commissioned an engineering firm to conduct measurements in the area, which were completed in June of 2004. By late July, 2004, the Commission had apparently evaluated the site and asserted in response to one of the Amateurs who complained on July 22, 2004 that notching is generally successful and that the Progress Energy trial was in compliance with Commission Rules. ARRL wrote to OET that same day, questioning the methodologies used in the Commission's investigation of the complaints. No response to that communication has ever been received by ARRL, and the interference continued until after September, 2004, until the system was shut down by Progress Energy, without any Commission adjudication.

In Cedar Rapids, Iowa, severe interference precluding Amateur Radio communications on numerous HF bands was suffered by a local resident for many months in early 2004. Finally, formal complaints were filed in May and June, 2004, when the radio amateur, himself an engineer, exhausted the ability of Alliant Energy to resolve the interference. Finally, the system was shut down by the operator, without any Commission adjudication of the complaint.

In Briarcliff Manor, NY, complaints were filed by a local radio amateur concerning the operation of Ambient Energy concerning the STA operation of a BPL system. Notching efforts were repeatedly attempted by Ambient, which resolved some interference on some amateur bands, only to have interference appear on other bands. This system is still operating, and interference has occurred periodically from March of 2004 through January of 2005.ARRL complaints premised on repeated visits by ARRL technical staff were filed October 12, 2004 and December 17, 2004 with the Enforcement Bureau and the Office of Engineering and Technology. Neither has been adjudicated, and no response has been received, other than an acknowledgement of receipt of one of the ARRL complaints. This system continues to operate without restriction.

In Cottonwood, AZ, complaints of interference and high radiated emission levels were filed in June of 2004 by a local Amateur Radio club. ARRL staff visited the site and took measurements, and a complaint of interference was filed by ARRL August 17, 2004. Electric Broadband, the BPL operator, responded in September, 2004 and additional measurement data was submitted by the local Amateur Radio club. ARRL responded to the Electric Broadband response, including additional measurement data and technical analysis. At the end of September, 2004, OET acknowledged the complaint. In October,

2004 ARRL objected to the Six Month Progress Report filed by Electric Broadband. Additional complaints by local Amateurs were filed in December of 2004, and a substitute BPL operator, MTI, asserted in January of 2005 that there is no harmful interference. No action has been taken by the Commission in this case.

In Cape Girardeau, Missouri and Lee's Summit, Missouri, ARRL's consulting engineering firm conducted measurements of BPL trial systems. ARRL filed complaints regarding these systems on September 8, 2004. No response from the BPL operator, and no response from the Commission (other than an acknowledgement of receipt of the complaints), has been received.

The Commission's rather notable inaction in these cases, and the severity of the interference, despite, in some cases, efforts by the BPL operator to fix the problems, reveals what can be expected in connection with BPL complaints going forward. It points up the critical importance of establishing rules which preclude interference in the first place, rather than trying to resolve interference after the fact. With Part 15 devices and systems, interference resolution is a losing proposition.

EXHIBIT E

EXHIBIT E
ARRL PETITION FOR RECONSIDERATION

Analysis of Distance Extrapolation of Field Strength Calculated from the Antenna Models Provided to the FCC in the BPL Notice of Rulemaking Comments and Reply Comments

1. Background

1.1 ARRL submitted a number of papers and studies to the FCC during the course of the BPL Notice of Inquiry (ET 03-104) and Notice of Proposed Rulemaking (ET 04-37). These submissions demonstrated to the Commission that the 40-dB/distance decade extrapolation permitted by §15.31(f)(2) is inappropriate for a large distributed emitter such as the medium-voltage wiring used by BPL.

1.2 In the BPL Report and Order, the FCC announced that is was choosing not to make any changes to the extrapolation permitted by §15.31(f)(2):

1.3 The R&O indicated that the FCC had relied heavily on the NTIA's antenna modeling to reach its decisions:

107. Decision. We find the extensive measurement and modeling efforts presented in the NTIA Phase 1 Study and the Technical Appendix to NTIA's comments to be highly useful in our efforts to develop appropriate measurement procedures for Access BPL. The scientific engineering in those submissions clarifies the interference potential of Access BPL on radio reception and the recommended techniques for measurement of Access BPL emissions provide us with a well thought-out plan on which to base our decisions on measurement issues. Our decision, discussed below, takes into account NTIA's research and adopts a modified version of its recommendations.

1.4 The R&O also indicated that the record supports the FCC's decision to continue to use a 40 dB/distance decade extrapolation:

109. Measurement Distance. Despite the stated aversion of NTIA and ARRL to distance extrapolation, we recognize that at many in situ test locations, it may not be possible or practicable to measure at the proposed fixed distances of 10 and 3 meters. If a 10-meter distance places the measurement antenna on a roadway, safety may dictate increasing the distance to, e.g., 14 meters in order to position the testers out of harm's way. Hence, we expect that distance extrapolation will be necessary for in situ testing. We note that NTIA's latest computer modeling results show that the variation of field strength with distance is consistent with the existing Part 15 distance extrapolation when used with the slant range distance to the power line as was proposed in Appendix C of the Notice. We also note that although the ARRL and ARINC recommend the use of a 20 dB per decade extrapolation factor rather than the existing 40 dB per decade in Part 15 for frequencies below 30 MHz, Ameren states that it has determined the characteristics of the fields near the line support the case for assuming a 40 dB per decade decay rate of the field away from

the line and recommends the use of the existing 40 dB per decade extrapolation factor. Given the lack of conclusive experimental data pending large scale Access BPL deployments, we will continue the use of the existing Part 15 distance extrapolation factors in our rules, but with the slant range rather than horizontal distance. If new information becomes available that alternative emission limit/distance standards or extrapolation factors would be more appropriate, we will revisit this issue at another time.

1.5 An analysis of the antenna models that the FCC used to reach its decision about the appropriate distance-extrapolation factor does not support its decision to continue to use 40 dB/decade for overhead BPL power lines. To the contrary, an analysis of the near-field regions surrounding the models shows that the maximum field strength at a distance of 30 meters distance from the emitter (generally upward from the power line) is related to the maximum field strength at the specified measurement points at 10 meters horizontally from the line at 1 meter height by approximately 20-dB/distance decade.

1.6 In the R&O, the FCC appropriately indicated that its goals in setting limits and measurements methodology were to protect radio services. The R&O offered the greatest protection to certain aeronautical services, indicating that the Commission understands that the emissions upward from radiating overhead power represent a significant factor in the EMC component to BPL operation. The Commission also gave consideration to the NTIA Phase II report about skywave noise that would result from the aggregate of many BPL devices. In many cases, nearby antennas, such as those in common use in the Amateur Radio Service, are located at greater height than the power lines. For these reasons, although the testing guidelines determine the method by which BPL systems should be tested, the rules set limits at 30 meters distance, irrespective of slant angle.

2. Analysis of Models

2.1 ARRL has analyzed a number of antenna models that were provided to the FCC in the rulemaking proceeding. These include:

- 340-meter length, 3-phase power line provided by NTIA
- 300-meter length, 2-phase power line provided by ARRL
- Multi-leg overhead power-line model based on description of power line provided to the FCC by Ameren

2.2 ARRL has intentionally chosen to analyze models of distinctly different characteristics. These include the simplified models NTIA used to reach its Phase-I conclusions to the more representative models supplied by ARRL and Ameren, representing typical imbalance and multi-legged power line installations. The conclusion that ARRL is drawing -- that 40-dB/decade is not a reasonable extrapolation factor for line emitters and that 20 dB/decade is appropriate -- is supported by a wide range of antenna models.

2.3 To determine that its findings were not unique to just one or two combinations of conditions, ARRL took these basic models and operated them at frequencies of 4 MHz; 10.1 MHz; 14 MHz; 21 MHz and 28 MHz. The models were fed in the following configurations:

- One phase, fed in center
- One phase, fed 25% from one end
- Two phases, balanced, fed differentially

2.4 ARRL first determined the point of maximum electric field at an actual distance of 30 meters. To do this, ARRL used the near-field function in NEC-4 and calculated the field strength along the line at intervals starting at 1 meter in height and extending to 30 meters above the power line. All of these calculations were made at a horizontal distance from the line that resulted in a slant-range distance of 30 meters from the line. This captured the maximum emission at a distance of 30 meters from the line, radially at all slant angles, along the entire length of line.

2.5 A separate calculation was made of the magnetic field at a horizontal distance of 10 meters from the overhead line, at a height of 1 meter. The maximum value of H field was then converted to an equivalent value of electric field by adding 51.5 dB. The measurement made at 10 meters horizontal distance was then extrapolated to 30 meters using the 20 dB/decade and 40 dB/decade respectively. The 40-dB/decade extrapolation consistently underestimated the actual field strength in any models that represented real-world BPL installations.

2.6 The results were as follows:

Table 1: Comparison of calculated E fields at 30 meters distance to H fields measured at 10 meters horizontal distance and extrapolated to 30 meters using various functions.

- = underestimates field by N dB

+ = overestimates field by N dB

Antenna model	Frequency MHz	Feed-point	Actual dBuV/m at 30 m distance	Actual H field at 10 meters horiz.E field equiv dBuV/m	H field extrapolated to 30 meters using 20 dB / decade	H field extrapolated to 30 meters using 40 dB / decade	Error when extrapolated at 20 dB / decade	Error when extrapolated at 40 dB / decade
NTIA-340m[1]	4	1-phase, center (50%)	29.54	40.4	32.8	25.2	+3.3 dB	-4.3 dB
NTIA-340m	10.1	1-phase, center (50%)	29.54	35.3	27.7	20.1	-1.9 dB	-9.5
NTIA-340m	14	1-phase, center (50%)	29.54	35.7	28.0	20.4	-1.5	-9.1
NTIA-340m	21	1-phase, center (50%)	29.54	35.1	27.5	19.9	-2.1	-9.7
NTIA-340m	28	1-phase, center (50%)	29.54	33.3	25.6	18.1	-3.9	-11.5
NTIA-340m	4	1-phase, offset (25%)	29.54	41.5	33.9	26.3	+4.4	-3.2
NTIA-340m	10.1	1-phase, offset (25%)	29.54	36.1	28.5	20.9	-1.1	-8.7
NTIA-340m	14	1-phase, offset (25%)	29.54	36.8	29.2	21.6	-0.3	-7.9
NTIA-340m	21	1-phase, offset (25%)	29.54	34.9	27.3	19.7	-2.2	-9.8
NTIA-340m	28	1-phase, offset (25%)	29.54	31.8	24.2	16.6	-5.4	-13.0
NTIA-340m	4	2-phase balanced[2]	29.54	46.7	39.1	31.5	+9.6	+2.0
Antenna	Frequency	Feed-	Actual	Actual H	H field	H field	Error when	Error when

[1] This model was described in the NTIA Phase I report. It modeled a 3-phase power line, fed in the center of one phase. None of the phases were grounded. The height was 8.5 meters. This is a slant-range distance of 12.5 meters to the measurement point.

[2] Although no power lines are nearly as well balanced as this model, these data were included to be complete. The results for balanced feed represent an ideal best case that will not exist in real-world installations.

model	MHz	point	dBuV/m at 30 m distance	field at 10 meters horiz.E field equiv dBuV/m	extrapolated to 30 meters using 20 dB / decade	extrapolated to 30 meters using 40 dB / decade	extrapolated at 20 dB / decade	extrapolated at 40 dB / decade
NTIA-340m	10.1	2-phase balanced[3]	29.54	38.0	30.4	22.8	+0.8	-6.7
NTIA-340m	14	2-phase balanced	29.54	37.9	30.3	22.7	-0.8	-6.9
NTIA-340m	21	2-phase balanced	29.54	35.0	27.4	19.8	-2.2	-9.8
NTIA-340m	28	2-phase balanced	29.54	33.2	25.6	18.0	-3.9	-11.5
ARRL-100m[4]	4	1-phase, offset (25%)	29.54	42.8	35.8	28.8	+6.3	-0.7
ARRL-100m	10.1	1-phase, offset (25%)	29.54	36.6	29.7	22.7	+0.1	-6.8
ARRL-100m	14	1-phase, offset (25%)	29.54	36.6	29.6	22.7	+0.1	-6.9
ARRL-100m	21	1-phase, offset (25%)	29.54	33.0	26.1	19.1	-3.5	-10.4
ARRL-100 m	28	1-phase, offset (25%)	29.54	32.6	25.6	18.7	-3.9	-10.9
Ameren multi-legged[5]	4	1-phase fed 25 meters from one end	29.54	35.9	28.9	21.9	-0.6	-7.6
Antenna model	Frequency MHz	Feed-point	Actual dBuV/m	Actual H field at	H field extrapolated	H field extrapolated	Error when extrapolated	Error when extrapolated

[3] At 10.1 MHz, any near-field effects that would increase the extrapolation to slightly greater than 20 dB/decade are no longer seen even in this ideal balanced model.

[4] This antenna model was described in a number of ARRL filings in the BPL rulemaking proceedings. It consists of two phases, one of which is grounded. The height is 10 meters. The slant-range distance to the measurement point is 13.45 meters.

[5] *This model was described in ARRL's paper, "Exhibit A – NEC Analysis of Power Lines as Radiators".* This report can be downloaded from the ECFS web page at http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6516214646. The height is 10 meters. The slant-range distance was presumed to be 9 meters – the worst case of the distance between the measurement point and overhead sections of the legs.

			at 30 m distance	10 meters horiz.E field equiv dBuV/m	to 30 meters using 20 dB / decade	to 30 meters using 40 dB / decade	at 20 dB / decade	at 40 dB / decade
Ameren multi-legged	10.1	1-phase fed 25 meters from one end	29.54	34.6	27.7	20.7	-1.9	-8.9
Ameren multi-legged	14	1-phase fed 25 meters from one end	29.54	31.7	24.8	17.8	-4.8	-11.8
Ameren multi-legged	21	1-phase fed 25 meters from one end	29.54	31.9	25.0	18.0	-4.6	-11.5
Ameren multi-legged	28	1-phase fed 25 meters from one end	29.54	36.4	29.4	22.4	-0.2	-7.1

3. Conclusions

3.1 These data show the following:

- A 40-dB/decade extrapolation underestimates the maximum field strength at 30 meters by as much as 11.5 dB. Although some near-field effects can be seen at lower frequencies, applying a 40-dB/decade extrapolation results in a significant error. The original statements made in the NTIA Phase I report and the engineering conclusions drawn by ARRL were correct – a 20-dB/decade distance extrapolation should be applied to measurements made closer than 30 meters distance.
- These data also show that the information provided by ARRL, NTIA, Ameren and others that an extrapolation for height for frequencies below 30 MHz should be applied. These data generally support the ARRL and Ameren position that 3.5 dB should be added to H field values measured at 1 meter in height.
- The data also show that it would be reasonable to apply a slightly greater than 20-dB/decade factor at lower frequencies.

3.2 It is not possible to disassociate height extrapolation, distance extrapolation and frequency effects. Throughout the proceeding, the FCC and BPL proponents have consistently asked for the most simple possible test procedures. To that end, the easiest distance and height extrapolation would be to add a reasonable number to measurements made at 1-meter in height[6] and then extrapolate for distance using a 20-dB/distance decade function.

3.3 However, the following extrapolation for height, distance and frequency combined provides a reasonable fit for the data provided in this analysis of available antenna models:

Equation 3.1 3.5 dB - 20log(30/slant range distance) – 10*log (FMHz/15)

3.4 It is critical that the actual emissions at 30 meters from BPL-carrying power lines not exceed 30 uV/m. All of the NTIA Phase II conclusions were based on the premise that the field strength at 30 meters distant from the radiator is actually at 30 uV/m. So was the NTIA premise that 20 dB of attenuation in the 13 BPL restricted bands is sufficient to generally protect government operation.[7] If 40 dB/decade is used to extrapolate measurements made as described in the FCC BPL test procedures, the field strength at 30 meters distance will exceed 30 uV/m. This would have the effect of invalidating all of the assumptions put into the skywave and interference analyses done by NTIA.

[6] ARRL could accept either the 5 dB height factor that NTIA proposed or the 3.5 dB height factor proposed by ARRL and Ameren.

[7] Reception in the Amateur Radio Service generally uses a very low noise margin. 20 dB is not sufficient to protect all radio users and NTIA was speaking only for government spectrum users when it determined that 20 dB of suppression in the prohibited bands would meet its needs.